

FAMILY HISTORY OF CARDIOVASCULAR-
RENAL DISEASE

ALTON P. MORTON

THE relationship between family history and longevity has been studied repeatedly in a number of investigations using insurance data. Various special studies have investigated the familial or hereditary tendency of certain diseases. One of the most interesting recent special studies of this nature to be published is in the *1951 Impairment Study*, covering cardiovascular-renal family history. The data consisted of over 17,000 applicants for insurance whose family history included two or more cases of cardiovascular-renal disease under age 60. Seven hundred thirty-one of the policies issued to these applicants terminated by death, giving the unexpectedly high ratio of 141% of the expected based on the 1935-50 Basic Table. All applicants were accepted as standard risks.

Associated minor impairments were noted in an estimated 40% of the cases, which was a somewhat higher proportion than found among all classes of impairments studied in the *1951 Impairment Study*. The possibility that associated minor impairments, particularly those of a cardiovascular nature, may be of special significance when associated with a family history of cardiovascular disease was not investigated. This paper describes the results of a further study to develop information on this possibility.

A further analysis was made of the Prudential data, which comprised 35% of the total of the *1951 Impairment Study* measured by the number of policies terminated by death. Prudential's over-all experience, based on 255 policies terminated by death, showed a ratio of 132% by the 1935-50 Basic Table, compared to the *Impairment Study* ratio of 141%. Females were 28% of the entrants in the Prudential contribution and 22% in the *Impairment Study*.

Our data were subdivided into three classes, identified as follows:

Class A. Cases without associated impairments of any kind.

Class B. Cases with minor impairments of a noncardiovascular nature. (See impairment list below.)

Class C. Cases with minor impairments of a cardiovascular nature.

Class B included such minor impairments as nonmalignant tumors, other unfavorable family history, sinusitis, hay fever, tonsillectomy, appendectomy, hernia, poor eyesight, pregnancy, minor impairments of the female organs, and coded special tests if shown with negative results.

All cases included in Classes A and B also met the following criteria for build and blood pressure:

Blood Pressure.—All entrants whose recorded systolic blood pressure was under 135 mm. where entry ages were under 50, or under 140 mm. where entry ages were 50 or over. For practical reasons diastolic readings were not used for classification purposes.

Build.—All entrants whose weight was not over 15% above the average weight for age 37 of the M.A. build study.

Combination of Build and Blood Pressure.—Cases with blood pressure within 5 mm. of the limit and also in the highest weight classification, 5–15% above average weight, were transferred to the borderline group, Class C.

Tests showed that the mortality of applicants included in Class B cases with minor impairments was almost exactly the same as for Class A cases without associated impairments of any kind. The data for Class B applicants were therefore not tabulated separately in the tables which follow.

Male Lives

The data for male lives are presented in Tables 1 and 2. Table 1 compares the mortality under Class A applicants with that for applicants of Classes B and C combined.

Table 2 compares the mortality of applicants of Classes A and B combined with that for Class C applicants.

Comparing Tables 1 and 2, it will be noted that including Class B exposures related to cases with miscellaneous minor impairments with those of Class A, cases without impairments of any kind, had little effect on the ratio of actual to expected deaths, while the ratio for the Class C group alone is sharply higher at 212% compared with 186% from Table 1.

Female Lives

The total number of deaths among female lives was 52. Their experience corresponding to that of Tables 1 and 2 for male lives is shown in Table 3. A greater subdivision of the data was not warranted in view of the small numbers.

From these results, it would appear that the more favorable mortality normal to females exists even among those with family histories of cardiovascular-renal disease. It would also appear that associated minor impairments, whether of a cardiovascular or other nature, are considerably less significant.

Age at Issue and Duration

From Tables 1 and 2 the varying effects by age and duration of cardiovascular-renal family history may be noted. Higher ratios are shown for ages below 50 than above. Among Class A applicants alone, or Class A

and B applicants combined, the only appreciable extra mortality seems to be concentrated in the age group 40-49, where the ratios are respectively 126% and 124%. A substantial extra mortality exceeding 200% applies at all ages below 50 in the Class C group. That underwriting was less effective among cases with a cardiovascular-renal family history is suggested by the higher ratios of the earlier durations. Furthermore, at the longer durations, 6-10 and 11-15, a substantial extra mortality persists. This

TABLE 1
MALE LIVES

| AGES | DURATIONS | CLASS A | | CLASSES B AND C | |
|----------------|-----------|------------------|-----------------|------------------|-----------------|
| | | Number of Deaths | Ratio Act./Exp. | Number of Deaths | Ratio Act./Exp. |
| Under 40..... | 1-5 | 9 | 107% | 11 | 220% |
| | 6-15 | 16 | 98 | 23 | 238 |
| | Total | 25 | 101% | 34 | 232% |
| 40-49..... | 1-5 | 10 | 133% | 13 | 159% |
| | 6-15 | 20 | 122 | 39 | 230 |
| | Total | 30 | 126% | 52 | 207% |
| 50 and over... | 1-5 | 9 | 116% | 14 | 113% |
| | 6-15 | 10 | 79 | 29 | 169 |
| | Total | 19 | 93% | 43 | 146% |
| All Ages..... | 1-2 | 13 | 169% | 14 | 173% |
| | 3-5 | 15 | 94 | 24 | 138 |
| | 6-10 | 30 | 103 | 65 | 226 |
| | 11-15 | 16 | 99 | 26 | 173 |
| | Total | 74 | 107% | 129 | 186% |

interesting fact suggests that by itself alone survival to any age—say 55 or 60—does not offset the influence of an adverse family history.

Cause of Death

Table 4 analyzes the deaths by cause. For the data corresponding to Table 2, for male lives, Class C, more than three-quarters of the total excess of approximately 60 deaths over the expected were due to cardiovascular-renal disease. "All other causes" at over one and one-half the normal accounted for the balance. It may be noted that even among the Class A and B applicants there is an excess of cardiovascular-renal deaths, though it is much less marked. There were ten more than normal

TABLE 2
MALE LIVES

| AGES | DURATION | CLASSES A AND B | | CLASS C | |
|-----------------|----------|------------------|-----------------|------------------|-----------------|
| | | Number of Deaths | Ratio Act./Exp. | Number of Deaths | Ratio Act./Exp. |
| Under 40..... | 1-5 | 10 | 103% | 10 | 269% |
| | 6-15 | 19 | 103 | 20 | 265 |
| | Total | 29 | 103% | 30 | 266% |
| 40-49..... | 1-5 | 13 | 136% | 10 | 163% |
| | 6-15 | 24 | 118 | 35 | 271 |
| | Total | 37 | 124% | 45 | 236% |
| 50 and over.... | 1-5 | 9 | 89% | 14 | 139% |
| | 6-15 | 14 | 85 | 25 | 187 |
| | Total | 23 | 87% | 39 | 166% |
| All Ages..... | 1-2 | 13 | 137% | 14 | 219% |
| | 3-5 | 19 | 96 | 20 | 147 |
| | 6-10 | 38 | 107 | 57 | 255 |
| | 11-15 | 19 | 96 | 23 | 201 |
| | Total | 89 | 105% | 114 | 212% |

TABLE 3
FEMALE LIVES

| | Number of Deaths | Ratio Act./Exp. | Number of Deaths | Ratio Act./Exp. |
|---------------|------------------|-----------------|------------------|-----------------|
| All Ages..... | Class A | | Classes B and C | |
| | 23 | 80% | 29 | 109% |
| All Ages..... | Classes A and B | | Class C | |
| | 28 | 82% | 24 | 113% |

TABLE 4
ANALYSIS OF DEATHS BY CAUSE

| CAUSE OF DEATH | MALE | | FEMALE | |
|--|------------------|-------|------------------|-------|
| | Number of Deaths | Ratio | Number of Deaths | Ratio |
| Classes A and B Combined | | | | |
| Diseases of heart and circulatory system.. | 45 | 129% | 6 | 89% |
| Vascular lesions affecting central nervous system..... | 4 | 101 | 1 | 48 |
| Nephritis..... | 2 | 119 | 5 | 364 |
| All other causes (excluding war deaths)... | 38 | 87 | 16 | 67 |
| All causes..... | 89 | 105% | 28 | 82% |
| Class C | | | | |
| Diseases of heart and circulatory system.. | 62 | 263% | 6 | 126% |
| Vascular lesions affecting central nervous system..... | 7 | 258 | 3 | 192 |
| Nephritis..... | 5 | 478 | 3 | 309 |
| All other causes (excluding war deaths)... | 40 | 151 | 12 | 86 |
| All causes..... | 114 | 212% | 24 | 113% |

TABLE 5
ANALYSIS OF DEATHS BY CAUSE FOR ALL GROUPS COMBINED

| Cause of Death | Number of Deaths | Ratio |
|--|------------------|-------|
| Tuberculosis..... | 7 | 209% |
| Malignant neoplasms..... | 39 | 97 |
| Diabetes mellitus..... | 5 | 238 |
| Vascular lesions affecting central nervous system..... | 15 | 145 |
| Diseases of heart and circulatory system..... | 119 | 170 |
| Pneumonia and influenza..... | 8 | 163 |
| Nephritis..... | 15 | 295 |
| Accident and homicide..... | 21 | 118 |
| Suicide..... | 6 | 80 |
| All other causes (excluding war deaths)..... | 20 | 62 |
| All causes..... | 255 | 132% |

or expected. These were largely offset by a deficiency in the category "All other causes," which accounted for about six less deaths than the expected number.

Table 5 analyzes the deaths of the entire study. This larger grouping permits a more detailed analysis and brings out the excess number of deaths from many causes, with cardiovascular-renal causes predominating. Only deaths due to suicide and to "All other causes" were significantly below normal.

CONCLUSIONS

The following conclusions seem warranted from the data and are offered as a convenient summary of the results of this study.

1. Any impairments of a cardiovascular-renal nature or overweight, apparently of only borderline significance when viewed alone, are of greatly increased significance if associated with a family history of cardiovascular-renal disease as defined. Family history may be significant even when deaths are at older ages than 60, but this was not studied.
2. Minor impairments of other types with family history of cardiovascular-renal disease appear to carry no particular added significance.
3. Higher ratios for the early durations suggest somewhat less effective selection at the time of underwriting applicants with a cardiovascular-renal family history. Whether this is due to a conscious antiselection by such applicants can be doubted. The *1951 Impairment Study* shows the same tendency to high ratios for early durations 1 and 2. Apparently when borderline features are present, great caution is necessary if initial underwriting selection is to be as effective as among applicants without borderline features of any kind.
4. A sustained extra mortality is associated with a combination of cardiovascular family history and minor physical impairments of a possibly related type.
5. Any applicants with a cardiovascular-renal family history are at least borderline risks and require careful underwriting. It is to be noted that even when wholly free of associated minor impairments of a possibly related nature, the ratio of actual to expected mortality is 126% for the important age group 40-49, male lives. More careful underwriting may have been a factor in the more favorable results at ages 50 and over in this section. Perhaps, also, significant signs of cardiovascular abnormalities are easier to recognize at ages 50 and over. More careful underwriting may also explain the lower ratios at ages 50 and over in the borderline sections of the data.
6. Female lives included in the study show less than the normal differential between male and female mortality in Classes A and B. On the other hand, the association of minor impairments of a possibly related nature or overweight seems to have a much less unfavorable effect among females.

I want to acknowledge gratefully the assistance of Mr. Barton S. Pauley and Mr. Harry L. Sutton, Jr., for their valuable help in the preparation and presentation of this material.

DISCUSSION OF PRECEDING PAPER

WILLIAM J. NOVEMBER:

The author has rendered a valuable service in bringing to us the mortality information contained in this paper. With the level of mortality in the *1951 Impairment Study* on individuals with a family history of cardiovascular-renal disease being so definitely substandard, the companies are faced with a serious practical problem in knowing how to underwrite such cases. It is possible, on a broad averaging basis, to assess a substandard rating to all applicants with the kind of cardiovascular-renal history that went into the intercompany study, but I suspect that companies will be reluctant to go that far. Even if some did, competitive considerations might make it difficult to sustain that position. The alternative approach is to make differentiations between the better and the worse risks, a course that companies are more likely to follow. Mr. Morton's paper gives us a basis for recognizing one sign that the underlying hereditary factors have begun to marshal their forces successfully, or that favorable ground is present on which those factors can make their full weight felt. Among male lives anyway, it seems amply clear that in association with cardiovascular-renal family history a minor impairment of a cardiovascular-renal nature (including a slightly elevated blood pressure) or a slight overweight condition calls for substandard treatment.

The more favorable findings for women are perhaps only superficially more favorable. It appears that the same basic table was used for measuring the expected deaths for women as for men. That in itself would produce rather low mortality ratios for a group of female lives even when the true level of mortality is moderately substandard relative to their own sex. If we assume a basic mortality for women which is 60% of the mortality for men and women combined (the percentage that was used for the discussion of the mortality results among female lives in the *1951 Impairment Study*), we find that the 113% mortality ratio for Class C female lives would be more like 190% of the normal mortality for women. This is not so different from the mortality observed for male lives. If the same process is applied to the standard mortality ratio of 82% for combined Classes A and B, the ratio of 82% becomes 137%. This is substantially higher than the mortality ratio of 105% for male lives. The author's comment on this phase of the investigation would be helpful.

I am sorry that I do not have material from my own company to supplement Mr. Morton's. We have been planning to make such an investigation but could not undertake the work prior to this meeting. We

do, however, have some collateral information which sheds some light on another possible type of differentiation among these applicants.

Last year we were curious about the relative importance of parents and siblings among the cardiovascular-renal family history deaths and completed a study that may be of interest at this time. The cases involved were issues of 1935 to 1949 on both male and female lives—the same as those entering into the 1951 Impairment Study—but the observation period was different. The exposures were taken from the policy anniversary in 1940 to the policy anniversary in 1952. (We started with the 1940 anniversaries because we were unable to review the application papers of a small group of cases, most of which had lapsed before 1940.) While our experience does not match the intercompany study in the period covered, the relative ratios obtained may nevertheless be of significance for this problem of finding a basis for distinguishing among the applicants who present us with unfavorable family histories of cardiovascular-renal disease.

Our findings were as shown in the accompanying table, the ratios being in relation to the mortality rates of our contemporaneous standard business. The part of the experience involving brothers and sisters only was not very large, but the differences were so consistent that this type of differentiation is probably valid. It would appear that the death of a parent from cardiovascular-renal disease is more unfavorable than the death of a brother or sister, and that the presence of three cardiovascular-renal deaths in the family history is distinctly less favorable than when there were only two.

| FAMILY HISTORY DEATHS FROM CVR DISEASE | AT LEAST ONE PARENT INCLUDED | | NO PARENT INCLUDED | | ALL CASES | |
|---|---------------------------------|--------------------|---------------------|--------------------|---------------------|--------------------|
| | Number of Claims | Mortality Ratio | Number of Claims | Mortality Ratio | Number of Claims | Mortality Ratio |
| Two deaths | 59 | 150% | 18 | 117% | 77 | 141% |
| Three or more deaths . . . | 19 | 358 | 5 | 160 | 24 | 285 |
| Two or more deaths | 78 | 175% | 23 | 125% | 101 | 160% |

EDWARD A. LEW:

Mr. Morton's analysis of the Prudential's experience on cases with a family history of early cardiovascular-renal disease represents a major contribution to the interpretation of one of the surprising results of the 1951 Impairment Study.

I have made an analysis parallel to Mr. Morton's, utilizing the Metropolitan's material, which, however, is only about half as large as the Prudential's. The comparative results are summarized in Table 1.

The Metropolitan's experience supports most of Mr. Morton's conclusions, namely that:

- (1) any minor impairment of the cardiovascular-renal system or overweight, when found together with a family history of early cardiovascular-renal disease, produces mortality well up in the substandard range—about 200% of standard;
- (2) there is evidence in the Metropolitan's experience of less effective selection of applicants with minor impairments of the cardiovascular-renal system or overweight, when found together with a family history of early cardiovascular-renal disease, as is indicated by the significantly higher mortality experienced in the first five years than in the subsequent policy durations;
- (3) a family history of early cardiovascular-renal disease, even though not associated with any minor impairments, constitutes a borderline risk, at least at ages 40 and over.

However, in the Metropolitan's experience, a family history of early cardiovascular-renal disease, when found together with minor impairments other than of the cardiovascular-renal system, also produced very high mortality, although based on only 12 policies terminated by death. Since the Prudential's corresponding experience (Class B) was based on only 15 policies terminated by death, I have some doubts as to the validity of Mr. Morton's conclusions regarding the lack of significance of minor impairments other than of the cardiovascular-renal system when found together with a family history of early cardiovascular-renal disease.

In the Metropolitan's experience, just as in the Prudential's, most of the excess mortality on cases with minor impairments of the cardiovascular-renal system or overweight found together with a family history of early cardiovascular-renal disease (Class C) was attributable to cardiovascular-renal disease, but in the Metropolitan's experience the mortality from all other causes was also twice the expected.

The proportion of females was smaller in the Metropolitan's than in the Prudential's experience, and the data on females with a family history of early cardiovascular-renal disease were too meager to warrant analysis.

FRANK G. WHITBREAD:

We are indebted to Mr. Morton and the Prudential for making available to us this most interesting and valuable study.

It is a very fine illustration of the type of mortality investigation for

TABLE 1

COMPARATIVE FINDINGS ON FAMILY HISTORY OF EARLY CARDIOVASCULAR-RENAL DISEASE
(Metropolitan and Prudential Contributions to 1951 Impairment Study on Males Insured at Standard Rates)
MORTALITY RATIOS AND POLICIES TERMINATED BY DEATH (in parentheses)

| | ANALYSIS BY AGE AT ISSUE | | | | | | ANALYSIS BY DURATION | | | | | |
|--|--------------------------|----------|------------|----------|------------------|----------|----------------------|----------|----------------|----------|---------------|-----------|
| | Ages under 40 | | Ages 40-49 | | Ages 50 and over | | Durations 1-5 | | Durations 6-15 | | All Durations | |
| | Met. | Pru. | Met. | Pru. | Met. | Pru. | Met. | Pru. | Met. | Pru. | Met. | Pru. |
| Class A..... | 85%(9) | 101%(25) | 146%(14) | 126%(30) | 130%(9) | 93%(19) | 124%(10) | 118%(28) | 116%(22) | 102%(46) | 118%(32) | 107%(74) |
| Class B..... | 351%(4) | 117%(4) | 211%(3) | 116%(7) | 295%(5) | 65%(4) | 388%(5) | 70%(4) | 236%(7) | 111%(11) | 282%(12) | 96%(15) |
| Class C..... | 177%(14) | 266%(30) | 154%(19) | 236%(45) | 284%(20) | 166%(39) | 268%(22) | 170%(34) | 163%(31) | 237%(80) | 194%(53) | 212%(114) |
| Classes A and B Combined | 111%(13) | 103%(29) | 154%(17) | 124%(37) | 163%(14) | 87%(23) | 160%(15) | 109%(32) | 132%(29) | 103%(57) | 140%(44) | 105%(89) |
| Classes B and C Combined | 199%(18) | 232%(34) | 160%(22) | 207%(52) | 286%(25) | 146%(43) | 284%(27) | 149%(38) | 173%(38) | 208%(91) | 206%(65) | 186%(129) |
| Metropolitan Experience on Cases without Record of Blood Pres- sure..... | 161%(10) | | 248%(11) | | 132%(2) | | 223%(8) | | 175%(15) | | 189%(23) | |

which we are finding a pressing need. With the wide expansion of substandard business in the past twenty-five years we are faced with an increasing desire for more refined investigation procedures which will make possible greater equity to the policyholder without loss to the Company.

It has been felt for many years that a family history of early degenerative conditions is a mortality handicap. Numerical rating systems provide a debit for early deaths from cardiovascular-renal conditions in the family history. In cases with physical findings or personal history of cardiovascular-renal complications sufficiently serious to require rating, it has not been difficult to add some debit for unfavorable family history. However, in cases where personal findings or history are borderline or nearly standard in character, it has been difficult to add this debit to make the risk substandard. The difficulty has been partly competitive and partly an inherent dissatisfaction with rating a case which has all the superficial appearances of being a standard risk.

Mr. Morton's paper has justified the hesitancy about rating some of these cases. It appears that where the borderline character of the risk arises from some condition not of a cardiovascular-renal nature the unfavorable family history affects the risk but little, although some care is indicated at ages 40-50, and perhaps over a somewhat broader age range. On the other hand, Mr. Morton shows that personal borderline findings or history of a cardiovascular-renal nature in combination with an unfavorable family history lead to a definitely increased mortality.

Standard mortality is so low at the younger ages that, as with many other impairments, the figures suggest a mortality which percentage wise decreases with advancing age at issue. The most satisfactory way of rating this type of mortality is still a little elusive.

With associated borderline impairments one would expect that some increase in mortality might be evident immediately but that some time would elapse before the progress of the condition would cause any serious effect on mortality. It is rather surprising that the early mortality should be so high.

In the study of albuminuria in the 1951 Impairment Study, there is evidence that the hazard increases with degree of overweight, but the effect of even minimal degrees of hypertension appears much more drastic. In the preliminary studies which the Lincoln has made of diabetes we get the impression that minor blood pressure variations and minor albumin findings are of material consequence, but that minor degrees of overweight may not be a problem. I have wondered whether the unfavorable results in Mr. Morton's Class C group were to a large extent due to the inclusion of borderline blood pressure cases and perhaps some borderline

albuminuria cases, with the minor degree of overweight having only a minor effect.

Many of us have talked rather glibly about blood pressures of 140 systolic and 90 diastolic being the dividing line between standard and sub-standard insurance and have discounted minor findings of albumin. With cases which are otherwise absolutely clean-cut, this may be quite satisfactory. Indeed we may be able to raise these limits. With the presence of other associated impairments even of a minor nature, we may find that albumin and elevated blood pressure have significance at much lower levels. We await the results of the Joint Study on overweight and blood pressure with much interest.

(AUTHOR'S REVIEW OF DISCUSSION)

ALTON P. MORTON:

A chief merit of any paper presenting data concerning mortality results is often that it stimulates the development and presentation of data by other companies. This has proved to be the case again here. The information presented by Messrs. Lew and November provides valuable additional evidence which, in general, confirms the conclusions presented with the Prudential's data.

The Metropolitan's data corresponding to Class A, cases without associated impairments of any kind, show very slightly higher mortality ratios than the Prudential's. For the important Class C, cases with minor impairments of a cardiovascular nature, however, their over-all ratios are slightly lower. By duration, their Class C ratios are higher than the Prudential's for years 1-5 but lower for years 6-15. By age their ratios tend to be somewhat lower at all issue ages below 50, but higher thereafter. In Class B, cases with minor impairments of a noncardiovascular nature, the Metropolitan's ratios are in marked contrast to the Prudential's, being sharply higher at all ages and durations. However, the number of deaths in both companies' data, 12 and 15 respectively, is too small a base for very firm conclusions of any kind. The difference in results may be largely due to accidental fluctuation. From the various differences noted in Classes A and C between the two sets of data, it would appear that somewhat different standards of initial selection may have been a factor, but they are not pronounced in any event. Probably fairly severe standards of selection obtained in both companies at most ages. Yet it is noted that, nevertheless, at ages 40 and up all classes showed a borderline or higher mortality. This quite clearly suggests that two deaths in a family history

of cardiovascular disease occurring at age 60 or under constitute a significant impairment.

The Equitable's data, presented by Mr. November, concerning the relative importance of cardiovascular disease with death occurring under age 60 in a parent compared with a sibling, gives interesting information using a slightly different approach. The evidence is conclusive, both as to the greater importance of the death of a parent compared with a sibling, and as to the markedly greater significance of three cases of death from cardiovascular-renal disease in the family history as compared with two. This would suggest that with two deaths, especially if siblings, the result may in some proportion of cases be accidental rather than significant of a hereditary trait. A greater probability that there is a significant hereditary factor is clearly implied either when there are two such deaths, at least one a parent, or when there are three deaths in the family history.

Mr. November draws attention to the female data and states that, by the more severe standard of normal female mortality, two cardiovascular family history deaths are at least as significant among females as among males. A practical course which some companies may be satisfied with is to measure the relative mortality of impairments among females against the less severe standard of the mortality table for mixed lives. This is the basis for the Prudential ratios in the paper, which for females of Classes A, B, or C, showed ratios within the range of standard acceptability.

Mr. Whitbread questioned the proportion of the different types of minor impairments involved in the Prudential data. A re-examination of our data shows that those with a minor finding of albumin constituted an almost insignificant number of cases—less than 1% over-all. Class C type cases showed the following: 10% of all applicants were "select" for both build and blood pressure, but showed some other minor cardiovascular-renal impairment. The other 90% broke down as follows:

31%—borderline blood pressure, select weight, possibly other minors

38%—borderline overweight, select blood pressure, possibly other minors

21%—borderline overweight *and* blood pressure, possibly other minors

The results retabulated in another form for the 90% remainder showed:

38%—borderline build and/or blood pressure, *no* other minor impairments of a cardiovascular-renal nature

52%—combined borderline build and/or blood pressure, *and with* some minor impairments of a cardiovascular-renal nature

I am grateful to all who discussed this paper for presenting additional data and comments which greatly enhanced its value.